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same origin. Considering the small differences in the above table to be due to errors of observation, we have 47.96 tenth-metres for the difference of position of the two lines; hence the wave-length of the second line is

for *N. G. C. 7027* 4958.2 tenth-metres
 for *G. C. 4373* 4956.9 “

or for the mean of the ten nebulae on page 278, 4957.7 tenth-metres.

The values obtained by other observers are as follows :

HUGGINS λ 4957.0
 D'ARREST 4956.6
 COPELAND 4958.0

THE MOTION OF *ARCTURUS* IN THE LINE OF SIGHT.

BY JAMES E. KEELER.

While the spectroscopic observations of nebulae described on page 265 *et seq.* were in progress, a few measures of the displacement of the *D* lines in the spectrum of *Arcturus* were made, and these measures, when corrected for the orbital motion of the earth, gave a motion of the star toward the solar system of only four English miles per second. In view of the fact that observations of the planets with the same apparatus gave results closely in accordance with theory (see, for example, the table on page 270), it appeared to be probable that the large motion of over fifty miles per second, hitherto accepted for this star, was erroneous, although the discrepancy led to a careful examination of all possible sources of error in our own apparatus. Without entering into the details of the various experiments which were made, it may be stated that no other evidence could be found for the existence of constant errors than the discordance between the measured motion of *Arcturus* and that which has been commonly accepted.

In No. 2896 of the *Astronomische Nachrichten*, Professor H. C. VOGEL gives the motions of a number of stars in the line of sight, determined by a photographic method with a much higher degree of precision than that of any previous measurements. *Arcturus* was not included in the list, but measures of the motion of this star have been kindly supplied by Professor VOGEL, with permission to publish

the results. It will be seen that their agreement with the Mt. Hamilton measures is extremely satisfactory. The unit adopted by Professor VOGEL—the German geographical mile—has been changed into English statute miles in the following table :

α Bootis. POTSDAM.

Date.	Observed Motion.	Earth's Motion.	Motion of Star Referred to Sun.
	<i>miles.</i>	<i>miles.</i>	<i>miles.</i>
1888, Oct. 5...	— 3.3	+ 2.3	— 5.6
1889, April 4...	— 6.5	— 2.3	— 4.2
“ April 30...	— 0.3	+ 4.6	— 4.9
“ May 17...	+ 4.7	+ 8.7	— 4.0
1890, April 15...	— 3.2	+ 0.6	— 3.8
“ May 23...	+ 6.2	+ 9.8	— 3.6
Mean.....			— 4.4 ± 0.2

The observations made at the Lick Observatory are as follows :

α Bootis. MT. HAMILTON.

Date.	Observed Motion.	Earth's Motion.	Motion of Star Referred to Sun.
	<i>miles.</i>	<i>miles.</i>	<i>miles.</i>
1890, April 10...	— 4.6	0.0	— 4.6
“ Aug. 7...	+ 10.4	+ 14.4	— 4.0
“ Aug. 15...	+ 9.3	+ 13.5	— 4.2
Mean.....			— 4.3

The observations are not sufficiently numerous for a reliable estimate of the probable error, and they are of very different weights, the measures of August 15th being much the best.